

STUDIES ON GENETIC VARIABILITY AND CHARACTER ASSOCIATION IN F5 GENERATION OF BLACKGRAM (*VIGNA MUNGO* (L) HEPPER)

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ABSTRACT

The present investigation consists of 24 genotypes of Blackgram including one check, which were grown under the Field Experiment Centre of the Department of GPB, SHUATS, Prayagraj during Kharif 2019 following RBD with three replications. The data was collected on 13 characters to evaluate the analysis of variance, heritability, genetic advance, coefficient of variation, correlation coefficient and path analysis. Based on the mean performance genotype PU-11-14 x LBG-791 followed T-4 and PU-11-14 x KU-96-7, were identified as desirable genotypes yield per plant. Highly significant variations were obtained on behalf of all characters studies. For all traits, the phenotypic coefficient of variance was higher than the genotypic coefficient of variation. Plant height had the highest heritability estimates, followed by clusters per plant, seeds per pod, and seed index. For yield per plant, the largest genetic progress percent of mean was observed. Traits with the highest heritability and the highest genetic advance percent of mean are governed by additive gene action, with equal contributions from additive and non-additive gene activity. Harvest index, Seed index, Pods per plant, Seeds per pod, Cluster per plant, Primary branches, and Plant height were all highly significant positives for SYPP. Seed yield was positively affected by days to 50% flowering, plant height, days to maturity, number of clusters per plant, pod length, number of seeds per pod, Seed Index, Biological yield, and Harvest index.

KEYWORDS: Blackgram, GCV, PCV, Heritability, Variability, Genetic Advance, Correlation Analysis & Path Analysis

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INTRODUCTION

Blackgram [*Vigna mungo* (L.) Hepper] is a member of the family fabaceae and sub-family papilionaceae. $2n = 2x = 22$ is the chromosome number of the Blackgram. This Pulse falls in the group under Asiatic species of the genus Phaseolus or Vigna. The Primary centre of origin of blackgram is India and it is believed to created from a wild progenitor of blackgram i.e. *Vigna mungo* var. *silvestris*. The wild species of blackgram are *Vigna trinerivus* or *Vigna sublobata* and *Vigna* var. *silvestris*. Later, Blackgram is spread to many countries of Europe, America, Asia and African continents. In India it occupies 50.31 lakhs hectare area and annual production of urdbean is 32.84 lakhs tones with productivity 653 Kg per hectare (Directorate pulse development, Ministry of Agriculture and Farmers Welfare-2018-19). In U.P, blackgram is grown in 5.88 lakhs hectare region with overall production of 3.05 lakhstones with productivity of 520 Kilogram per hectare (Pulse Handbook 2018). Blackgram is a very good mixture of all types of nutrients, which contains proteins are about 25% to 26%, carbohydrates are about 60%, fats are about 1.5%, amino acids, minerals and vitamins in less amount. Blackgram stands after the soybean crop in its nutritive protein content. Blackgram is lavish in Vitamin A, Vitamin B1, Vitamin B3 and also contain low quantity of Vitamin C, Niacin, Riboflavin and thiamine. It is richest in phosphoric acid among pulses. Blackgram contains around 78% to 80% of albumin and globulin in the form of nitrogen. Dry seeds of Blackgram are good source of

phosphorous content and also have very good amount of calorie content.

MATERIALS AND METHODS

A total of 24 blackgram genotype accessions were obtained from the Sam Higginbottom University of Agriculture, Technology & Sciences, Prayagraj's division of Genetics and Plant Breeding (Uttar Pradesh). The accessions are evaluated with the help of randomized block design (RBD) by the help of three replications. Investigation was carried out at Field Experiment Centre of the Branch of Genetics and Plant Breeding (GPB), Naini Agriculture Institute, Sam Higginbottom University of Agriculture, Technology & Sciences, Prayagraj (Uttar Pradesh), during the time of *Kharif*-2019. Current investigation is an effort has been made toward assess the amount of genetic variability, heritability, genetic advance, yield contributing components along with direct and indirect effects in the blackgram accessions. Data were recorded on 13 characters *viz*; Days to 50% flowering, days to maturity, days to 50% pod setting, number of primary branches per plant, plant height (cm), number of pods per plant., number of clusters per plant, pod length (cm), biological yield (g), harvest index (%), number of seeds per pod, seed index (g), and seed yield per plant(g).

RESULT AND DISCUSSIONS

A perusal of mean performance among 24 blackgram genotypes recorded that PU-11-14 x LBG-791 genotype showed higher Seed yield per plant (10.17), subsequently T-4 (10.13) and PU-11- 14 x KU-96-7 (8.97). In Check variety the Number of clusters per plant was more compared to other genotypes, which has mean value of 8.49.

In all of the characters, phenotypic coefficients of variance were larger than genotypic coefficients of variation. For all of the traits, the phenotypic coefficient of variation (PCV) and genotypic coefficient of variation (GCV) are not very high. Harvesting index (13.41) was found to have the highest GCV, followed by Seed yield per plant (13.30), while Pods per plant (9.99), Plant height (8.86), Clusters per plant (8.38), Seed index (6.59), Number of Seeds per pod (6.59), Number of seeds per pod (6.01), Pod length (4.63), Biological yield (4.45), Days to 50 percent flowering (2.20), Primary branches per plant (1.93), Days to 50 percent Pod setting (1.36).

Harvesting index (20.25), Seed yield per plant (18.22), and Number of pods per plant (14.03) received moderate PCV ratings, while Plant height (9.36), Number of clusters per plant (9.11), Biological yield (8.45), Seed index (8.12), Seeds per plant (7.10), Pod length (6.79), NPB (4.56), Days to 50% flowering (4.21), Days to 50% pod setting (2.79), and Days to maturity (4.56) received low PCV ratings (3.26).

Plant height (89.68 percent), followed by Clusters per plant (84.73 percent), Seeds per pod (71.70 percent), Seed index (66.01 percent), and seed yield per plant (53.30 percent), number of pods per plant (50.67 percent), pod length (46.61 percent), harvest index (43.88 percent), Days to 50 percent pod setting (42.02 percent), Days to maturity (39.02 percent), and lo (18.00 percent).

Genetic advance as a percent of mean was highest for Seed yield per plant (SYPP) (20.01 percent), Harvesting index (18.31 percent), Plant height (17.29 percent), and Number of cluster per plant (15.89 percent), while moderate genetic gain was observed for Number pods per plant (14.65 percent), Seed index (11.03 percent), Number of seeds per pod (10.49 percent), and left over characters showed less genetic agglomeration.

Seed yield per plant had a strong significant positive link with Harvest index (0.966**), Seed index (0.667**), Pods per plant (0.434**), Seeds per pod (0.366**), and Cluster per plant (0.324**) according to a genotypic correlation

coefficient analysis.

Seed yield per plant exhibited a high significant and positive link with Harvest index (0.912**), Seed per pod (0.537**), Seed index (0.433**), Primary branches per plant (0.383**), and Plant height (0.323**) in a phenotypic correlation coefficient analysis.

Days to 50% blooming, Plant height, Seeds per pod, Seed index, Biological yield, and harvest index all had a positive and direct effect on Seed yield, according to a genomic path coefficient analysis. Days to 50% pod setting, Days to maturity, Number of primary branches, Clusters per plant, Pods per plant, and Pod length all had a negative direct effect on Seed yield per plant.

Days to maturity, Number of clusters per plant, Pod length, Number of seeds per pod, Seed index, Biological yield, and Harvesting index all showed a positive and direct effect on Seed yield in phenotypic path coefficient analysis. Days to 50% flowering, Days to 50% pod setting, Plant height, Number of primary branches, and Pods per plant all had a negative direct effect on seed yield per plant.

CONCLUSIONS

It is concluded that genotype **PU-11-14 x LBG-791** was identified as desirable genotype with highest grain yield. Substantial amount of variability were witnessed indelible rate genotypes. Harvest index and Seed yield per plant both had moderate genotypic coefficients of variation. Harvest index, Seed yield per plant, and Pods per plant all had moderate phenotypic coefficients of variation. High heritability was found in plant height, clusters per plant, seeds per pod, and seed index. Harvesting index, Plant height, and Clusters per plant showed the most genetic progress. Harvest index, Seed index, Seeds per pod, Pods per plant, Clusters per plant, Number of Primary branches, and Plant height all had substantial and positive genotypic and phenotypic correlations with seed yield per plant. Days to 50% flowering, Plant height, Days to maturity, Number of clusters per plant, Pod length, Number of seeds per pod, Seed index, Biological yield, and Harvest index all had positive direct influences on Seed yield, according to the path investigation results. Therefore, selection can be implemented upon these accessions for yield development of blackgram.

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Table 1: Study of Variance for 13 Quantitative Characters of Blackgram Accessions

Sl. No	Features	Mean Sum of Squares		
		Replications (D.F=02)	Treatments (D.F=23)	Error (D.F=46)
1.	Days for 50% flowering	0.9425	4.78*	2.258
2.	Days for 50% pod setting	2.0335	3.94**	1.243
3.	Day of maturity	0.484	4.14**	1.419
4.	Plant Height	36.2365	136.35**	5.037
5.	Number of Primary branches	0.0065	0.036*	0.02
6.	Number of Cluster per plant	0.2305	1.16**	0.066
7.	Number of Pods per plant	1.2635	19.46**	4.768
8.	Pod length	0.08	0.18**	0.049
9.	Number of Seed per pod	0.0255	0.54**	0.063
10.	Seed yield per plant	4.344	4.23**	0.956
11.	Seed index	0.0385	0.22**	0.032
12.	Biological yield	19.503	122.43**	2.032
13.	Harvesting index	200.579	4.23**	36.701

Table 2: Assessments for Variance and Genetic Parameters in Different Characters in Blackgram Accessions

Sl. No	Characters	Genotypic variance	Phenotypic Variance	Coefficient of Variation		Heritability	Genetic Advance	Genetic Advance as Percentage of Mean
				Genotypic Coefficient of Variation	Phenotypic Coefficient of Variation			
1.	Days for 50% flowering	0.84	3.10	2.20	4.21	27.18	0.99	2.36
2.	Days for 50% pod setting	0.90	2.14	1.81	2.79	42.02	1.27	2.41
3.	Day of maturity	0.91	2.32	1.36	2.17	39.02	1.23	1.75
4.	Plant Height	43.77	48.81	8.86	9.36	89.68	12.91	17.29
5.	Number of primary branches	0.01	0.03	1.93	4.56	18.00	0.06	1.69

6.	Number of cluster per plant	0.36	0.43	8.38	9.11	84.73	1.14	15.89
7.	Number of pods per plant	4.90	9.67	9.99	14.03	50.67	3.25	14.65
8.	Pod length	0.04	0.09	4.63	6.79	46.61	0.29	6.52
9.	Number of seeds per pod	0.16	0.22	6.01	7.10	71.70	0.70	10.49
10.	Seed index	0.06	0.09	6.59	8.12	66.01	0.42	11.03
11.	Biological yield	0.78	2.81	4.45	8.45	27.73	0.96	4.83
12.	Harvesting index	28.58	65.28	13.41	20.25	43.88	7.35	18.31
13.	Seed yield per plant	1.09	2.05	13.30	18.22	53.30	1.57	20.01

Table 3: Estimation of Genotypic Correlation Coefficient among yield and it Straits in 24 Blackgram Accessions

Character s	Days for 50% Flowering	Days for 50% pod Setting	Days to maturity	Plant Height	No. of primary branches	No. of clusters per plant	No. of pods per plant	Pod length	No. of seeds per Pod	Seed Index	Biological yield	Harvesting Index	Seed yield/Plant
Days to 50% Flowering	1	-0.636*	-0.083	0.158	0.430**	0.036	0.362*	0.088	0.045	-0.168	-0.289*	0.090	0.012
Days to 50% pod setting		1	0.603**	-0.054	-0.051	0.653*	-0.037	0.443*	0.223	0.535*	0.349**	-0.150	-0.071
Days to Maturity			1	0.107	0.161	-0.391*	0.335*	-0.125	0.425*	0.653*	-0.577**	0.069	-0.157
Plant height				1	0.289*	0.053*	0.054	0.136	-0.074	0.332*	0.375**	0.047	0.072
No. of primary Branches					1	-0.318*	0.575*	0.528*	0.325*	-0.040	-0.419**	0.020	0.427**
No. of clusters per Plant						1	0.315*	-0.250*	0.549*	0.295*	-0.092	0.135	0.324**
No. pods per Plant							1	0.528*	0.066	-0.283*	0.105	-0.496**	0.434**
Pod length								1	-0.046	-0.230	0.491**	-0.237*	-0.097
No. of seeds per Pod									1	-0.078	-0.316**	0.117	0.366**
Seed index										1	-0.254*	0.680**	0.667**
Biological Yield (g)											1	-0.212	0.068
Harvesting Index (%)												1	0.966**

Seed yield/ Plant													1
1. * -- Significant at 5%. 2. **-- Significant at 1%.													

Table 4: Estimation of Phenotypic Correlation Coefficient between yield and its Related traits in 24 Blackgram Genotypes

Characters	Days for 50% Flowering	Days for 50% pod setting	Days to maturity	Plant height	No. of primary branches	No. of clusters per plant	No. of pods per plant	Pod length	No. of seed per Pod	Seed index	Biological yield	Harvest index	Seed yield per plant
Days for 50% Flowering	1	-0.125	-0.074	0.162	0.098	-0.028	-0.154	0.065	0.074	-0.095	0.008	0.016	0.001
Days for 50% pod setting		1	0.185	-0.068	0.052	-0.348**	0.097	0.065	0.101	-0.277*	0.122	-0.075	-0.069
Days to Maturity			1	0.088	-0.023	-0.154	0.136	0.006	0.174	-0.291*	-0.107	-0.037	-0.069
Plant Height				1	0.082	-0.056	0.022	0.148	-0.029	-0.196	0.152	0.047	0.323**
No. of Primary Branches					1	-0.121	-0.236*	-0.157	0.157	0.012	-0.040	0.112	0.383**
No. of Clusters per Plant						1	-0.162	-0.104	-0.408**	0.208	-0.115	0.099	0.095
No. of Pods per Plant							1	0.149	0.059	-0.129	-0.035	-0.190	-0.248*
Pod length								1	0.089	-0.129	0.216	-0.113	-0.012
No. of seeds per pod									1	-0.030	-0.178	-0.036	0.537**
Seed Index										1	-0.080	0.380**	0.433**
Biological Yield											1	-0.385**	-0.030
Harvesting Index												1	0.912**
Seed yield per Plant													1

* Significant at 5 % ** Significant at 1 %.

Table 5: Estimate of Direct and Indirect Result among yield and its Related Characters in 24 Blackgram Accessions at Genotypic Level

Characters	Days for 50% flowering	Days for 50% pod setting	Days to maturity	Plant height	No. of primary branches	No. of clusters per plant	No. of pods per plant	Pod length	No. of seeds per pod	Seed index	Biological yield	Harvest index
Days for 50% flowering	0.00506	0.00896	0.00576	0.02886	-0.15694	-0.00873	0.096	-0.00384	0.0002	-0.0217	-0.0113	0.06961
Days for 50% pod setting	-0.00322	-0.01408	-0.04184	-0.00979	0.01855	0.15986	0.00977	-0.01931	0.0012	-0.0694	0.01361	-0.11681

Days maturity	-0.00042	-0.00848	-0.0694	-	-0.05872	0.09579	-0.0889	0.0044	0.002	-	-0.0225	0.05329
Plant height	0.0008	0.00075	-0.0074	0.18275	-0.10557	0.01294	-	-	-	-0.043	0.01465	0.03669
No. of primary branches	0.00218	0.00072	-0.01116	0.05285	-0.36505	0.07792	0.15237	0.02304	0.0017	-	-0.0163	0.01537
No. of clusters per plant	0.00018	0.00919	0.02715	-	0.11618	-0.24483	0.0356	0.0109	-	0.0383	-0.0036	0.10511
No. of pods per plant	-0.00183	0.00052	-0.02328	0.0098	0.20988	0.0772	-	-	0.0003	-	0.00412	-
Pod length	0.00045	-0.00623	0.008677	0.02486	0.1929	0.06121	-	-0.0436	-	-	0.01916	-
No. of seeds per pod	0.00023	-0.00314	-0.02946	-	-0.11878	0.13442	-0.1737	0.00198	0.0052	-	-0.0123	0.09132
Seed index	-0.00085	0.00752	0.04532	-	0.01443	-0.07221	0.07495	0.01002	-	0.1297	-0.0099	0.52908
Biological yield	-0.00146	-0.00491	0.04008	0.06857	0.15282	0.02246	-	-0.0214	-	-	0.03904	-
Harvest index	0.00045	0.00211	-0.00476	0.00862	-0.00721	-0.03309	0.1314	0.01031	0.0006	0.0883	-0.0083	0.77759

Table 6: Estimation of Direct and Indirect Effect among yield and its Related Characters in 24 Blackgram Accessions at Phenotypic Level

Characters	Days for 50% flowering	Days for 50% pod setting	Days to maturity	Plant height	No. of primary branches	No. of clusters per plant	No. of pods per plant	Pod length	No. of seed per pod	Seed index	Biological yield	Harvest index
Days for 50% flowering	-0.0154	0.00296	-0.00278	-	-0.00413	-0.00071	0.00724	0.00242	0.0028	-	0.00326	0.01668
Days for 50% pod setting	0.00192	-0.02376	0.00693	0.00244	-0.00219	-0.00886	-	0.22244	0.0038	-	0.04691	-0.07733
Days maturity	0.00115	-0.00441	0.03737	-	0.00096	-0.00393	-	0.00021	0.0066	-	-0.0413	-0.03861
Plant height	-0.0025	0.00161	0.0029	-0.0361	-0.00346	-0.00142	-	0.00554	0.0011	0.0119	0.05856	0.04913
No. of primary branches	-0.0015	-0.00123	-0.00085	-	-0.04221	-0.00309	0.011	-	0.0059	0.0007	-0.0156	0.11674
No. of clusters per plant	0.00043	0.00826	-0.00576	0.00202	0.00512	0.0255	0.00759	-	0.0154	0.0126	-0.0442	0.10237
No. of pods per plant	0.00237	-0.00231	0.0051	-	0.00998	-0.00412	-	0.00559	0.0022	-	-0.0133	-0.19747
Pod length	-0.00099	-0.00154	0.00021	-	0.00661	-0.00266	-0.007	0.0375	0.0034	-	0.08331	-0.1177
No. of seeds per pod	-0.00114	-0.0024	0.00651	0.00104	-0.00664	-0.01041	-	0.0035	0.078	-	-0.0687	-0.03754
Seed index	0.00147	0.00658	-0.01087	0.00709	-0.0005	0.0053	0.00605	-	0.0011	0.0604	-0.0308	0.3942
Biological yield	-0.00013	-0.00289	-0.00401	-	0.00171	-0.00292	0.00162	0.00811	-	-	0.38534	-0.39981

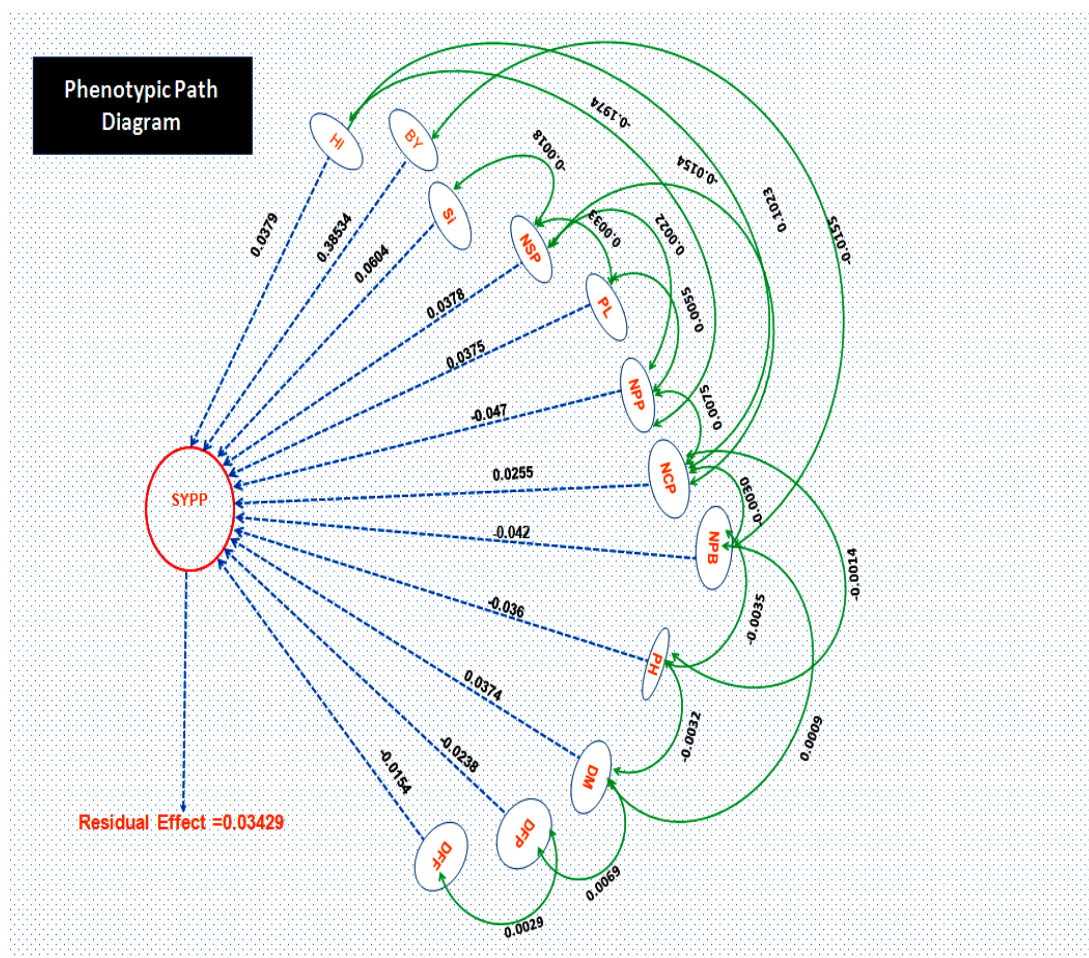


Diagram 2: Phenotypic Path Diagram for Seed Yield Per Plant.